Climate Tips

Faced with multiple global tipping points, scientists are considering new ways of thinking and acting.

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it today I feel that some interesting lessons and observations can still be made from it. First of all, the core of the joke is the self-identification that seems common in Canada, envisioning ourselves as a staid, fiscally conservative bunch. As a Torontonian, I can't tell you how many times I've heard (or said!) that things happen slowly around here, that we'll never be on the front of any big movement or change. We're always watching from the sidelines, waiting to see if the water is safe before we go in. Whether this characterization is valid or not, I think it's fair to say that this is often how we perceive ourselves.

The other thing I take from that joke is the reminder of what it means to tip, as in tipping over a canoe. Once you lose that stable centre of balance, all bets are off. The canoe's rotational momentum takes over, and nobody in the canoe will avoid getting wet. Once you've been dumped in the water, returning the canoe to its upright position isn't easy, and getting back into the boat is tough. You'd better know how to swim. And I think it's fair to say that that's a useful analogy to start with when thinking about global tipping points involving climate change.

As a PhD student in Berlin, I studied two shallow lakes in the heart of Brandenburg forests. Although these lakes were similar in many ways, one of them had "flipped" at some point in the previous decades, from clear-water conditions with large submerged plants to a turbid state with only algae growing in it. Since the 1990s, scientists studying lakes have worked to understand how these "regime shifts" can happen—essentially, why such a sudden change occurs in a lake ecosystem once a critical threshold, or "tipping point," has been crossed from human impacts (for instance, agricultural runoff). Arguably, the most important lesson has been that ecosystems can be strongly influenced by feedback loops. In the case of lakes, those large submerged plants need clear water to grow, but they also keep the water clear by stabilizing the mud at the bottom of the lake, taking up nutrients, and interacting with other organisms in the lake. At some point, if conditions get bad enough to kill those plants, a new series of feedbacks will kick in, making the lake more turbid and difficult to return to a clear-water state.

One of the first scientists to describe this process in shallow lakes is Marten Scheffer, who has later gone on to argue that such regime shifts exist all around us. According to Scheffer, our world is in a delicate balance where feedback loops might keep us stable in one spot, but we're always at risk of crossing a threshold beyond which another feedback loop will kick in, transporting us to a new state. Certainly, we've come to see that many ecosystems around the world, ranging from grasslands to coral reefs, can feature regime shift characteristics. More broadly, a widespread concern of scientists today is the possible existence of a global tipping point threshold that we might cross when it comes to planetary warming, setting off a chain reaction that will accelerate climate change, flipping the planetary state into some as-yet unknown regime. Evidence suggests that climate feedbacks are already happening—for instance, with permafrost thaw in the Arctic enhancing methane emissions from lakes. Recent studies have identified many major potential tipping points across the planet, and these studies warn that crossing one tipping point can also make crossing the others easier. The Intergovernmental Panel on Climate Change warns that we must keep our planetary temperature below a warming of 1.5°C to avoid crossing a global tipping point. To date, we have warmed our planet already by at least 1.1C. If we want to avoid crossing the 1.5°C threshold, we will need to stop adding greenhouse gases to the atmosphere (reaching net zero emissions) by 2050, preferably sooner.

We can learn still more from regime shifts in lakes, though. While early studies described lakes as existing in just two states (clear or turbid), more recent studies have shown that the picture isn't so simple. Some studies describe intermediate states, or multiple self-reinforcing states depending on what type of plant community is present. Scientists still stress the importance of feedback loops in shaping lake conditions, yet the knowledge we're gaining about the complexity of lake ecosystems is revealing a new picture in which there may not be one single tipping point that determines the future of a lake but rather a range of interacting drivers and states. We can't, of course, say that what's true for lakes will be true for the Earth. At the same time, it would be hard to argue that small, shallow lakes are more complex than the planetary system.

This isn't to argue that we shouldn't be concerned about crossing the 1.5°C threshold— the best knowledge available to us points to that as being a boundary to stay below. But we should be cautious when considering what such numbers mean to us and our societal planning. Major destructive feedback loops might be set in motion sooner or somewhat later than when the 1.5°C threshold is crossed. We are not necessarily safe below 1.5°C warming, nor are we necessarily doomed slightly above it. Our takeaway should be to do everything we can to avoid crossing this threshold but also to avoid every additional fractional increase in temperature if that threshold is passed. Ultimately, we cannot get to net zero soon enough, and the broad societal benefits that come with reaching that goal should suffice as the primary impetus to accelerate that progress, rather than fear of what lies at or beyond 1.5°C.

The research and writing that Scheffer has carried out over the years has taken the concepts of regime shifts in lakes and applied them not only to planetary thinking but also to human societies. Scientists around the world are now painting a picture of how sudden transformations can occur whereby societies embrace new realities, new ways of thinking and acting. When people think of regime shifts, they tend to focus on the tipping point itself, the sudden underway and that seems to fly in the face of our self-effacing image. I don’t see inertia; I see Canada tipping.

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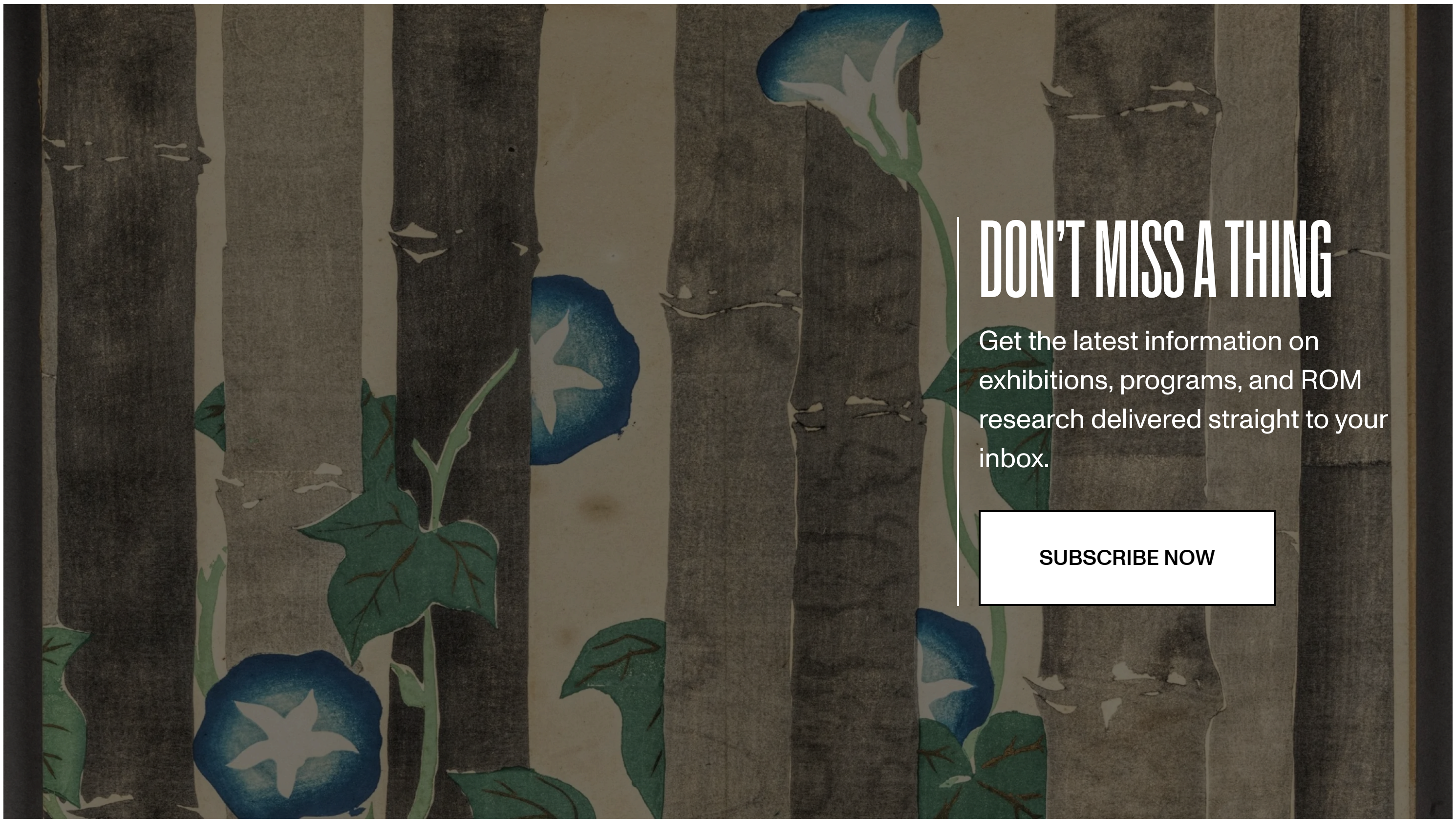

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